Ethernet and Gigabit Ethernet Switching Modules

This chapter describes the Ethernet and Gigabit Ethernet switching modules, and it contains these sections:

- 10/100 and 10/100/1000 Ethernet Switching Modules, page 2-1
- Gigabit Ethernet Switching Modules, page 2-13
- Ethernet Module LEDs, page 2-21

10/100 and 10/100/1000 Ethernet Switching Modules

Note Specific combinations of supervisor engines and modules may not be supported in your chassis. Refer to the release notes for the software version running on your system for specific information on modules and supervisor engine combinations that are not supported.

This section describes these 10/100 and 10/100/1000 Ethernet switching modules:

- 24-Port 10BASE-FL Ethernet Switching Module (WS-X6024-10FL-MT), page 2-4
- 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6148-GE-TX), page 2-4
- 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6148V-GE-TX), page 2-4
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6148-RJ21V), page 2-5
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6148-RJ45V), page 2-6
- 24-Port 100BASE-FX Ethernet Switching Module (WS-X6224-100FX-MT), page 2-6
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248-RJ45), page 2-7
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248-TEL), page 2-7
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248A-TEL), page 2-7
- 24-Port 100BASE-FX Ethernet Switching Module (WS-X6324-100FX-MM), page 2-8
- 24-Port 100BASE-FX Ethernet Switching Module (WS-X6324-100FX-SM), page 2-8
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ21V), page 2-9
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ-45), page 2-9
- 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ45V), page 2-10

- 24-Port 100BASE-FX Fabric-Enabled Ethernet Switching Module (WS-X6524-100FX-MM), page 2-10
- 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6548-GE-TX), page 2-11
- 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6548V-GE-TX), page 2-11
- 48-Port 10/100BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6548-RJ-21), page 2-12
- 48-Port 10/100BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6548-RJ-45), page 2-12
- 48-Port 10/100/1000BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6748-GE-TX), page 2-13

Table 2-1 lists the features of the Ethernet switching modules.

Table 2-1 Ethernet Switching Modules Features

Product Number	Backplane Connection	Forwarding	Inline Power[1]	Port Buffer Size	Queues Per Port
WS-X6024-10FL-MT	32 Gbps Bus	Centralized	No	128 KB	2 transmit, 1 receive
WS-X6148-GE-TX	32 Gbps Bus	Centralized	Optional[2]	128 KB	2 transmit, 1 receive
WS-6148V-GE-TX	32 Gbps Bus	Centralized	Yes	128 KB	2 transmit, 1 receive
WS-X6148-RJ21V	32 Gbps Bus	Centralized	Yes	128 KB	2 transmit, 1 receive
WS-X6148-RJ45V	32 Gbps Bus	Centralized	Yes	128 KB	2 transmit, 1 receive
WS-X6224-100FX-MT	32 Gbps Bus	Centralized	Yes	128 KB	2 transmit, 1 receive
WS-X6248-RJ-45	32 Gbps Bus	Centralized	No	128 KB	2 transmit, 1 receive
WS-X6248-TEL	32 Gbps Bus	Centralized	No	128 KB	2 transmit, 1 receive
WS-X6248A-TEL	32 Gbps Bus	Centralized	No	128 KB	2 transmit, 1 receive
WS-X6324-100FX-MM	32 Gbps Bus	Centralized	No	128 KB	2 transmit, 1 receive
WS-X6324-100FX-SM	32 Gbps Bus	Centralized	No	128 KB	2 transmit, 1 receive
WS-X6348-RJ21V	32 Gbps Bus	Centralized	Yes	128 KB	2 transmit, 1 receive
WS-X6348-RJ-45	32 Gbps Bus	Centralized	Optional[2]	128 KB	2 transmit, 1 receive
WS-X6348-RJ45V	32 Gbps Bus	Centralized	Yes	128 KB	2 transmit, 1 receive

Table 2-1 Ethernet Switching Modules Features (continued)

Product Number	Backplane Connection	Forwarding	Inline Power[1]	Port Buffer Size	Queues Per Port
WS-X6524-100FX-MM	Switch Fabric and Bus	Centralized Supports optional DFC card	No	1 MB	4 transmit, 2 receive
WS-X6548-GE-TX	Switch Fabric and Bus	Centralized	Optional[2]	1 MB	4 transmit, 2 receive
WS-6548V-GE-TX	Switch Fabric and Bus	Centralized	Yes	1 MB	4 transmit, 2 receive
WS-X6548-RJ-21	Switch Fabric and Bus	Centralized Supports optional DFC card	No	1 MB	4 transmit, 2 receive
WS-X6548-RJ-45	Switch Fabric and Bus	Centralized Supports optional DFC card	No	1 MB	4 transmit, 2 receive
WS-X6748-GE-TX	Switch Fabric	CEF720	No	1.3 MB	4 transmit, 2 receive

1. Supports IP phones.
2. Supports an optional inline power field upgrade module (WS-F6K-VPWR=)

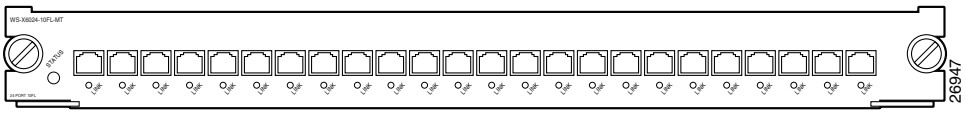
24-Port 10BASE-FL Ethernet Switching Module (WS-X6024-10FL-MT)

The 24-port 10BASE-FL switching module (WS-X6024-10FL-MT) provides 24 switched, 10-Mbps, full- or half-duplex ports. (See Figure 2-1.) The module has 24 MT-RJ connectors for connection to multimode fiber-optic (MMF) cable.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Note This module is a Class 1 laser product. Refer to the *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers* for information on working with lasers.

Figure 2-1 24-Port 10BASE-FL Ethernet Switching Module (WS-X6024-10FL-MT)

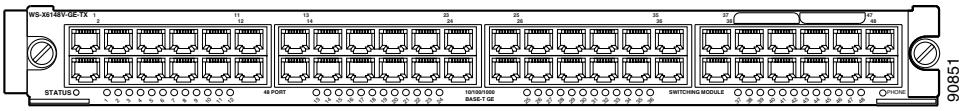


The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6148-GE-TX)

The 48-port 10/100/1000BASE-T switching module (WS-X6148-GE-TX) provides 48 switched, 10/100/1000-Mbps autosensing, full- or half-duplex ports. (See Figure 2-2.) The module has 48 RJ-45 connectors for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. This module can be upgraded with an inline-power daughter card to support IP phones.

Figure 2-2 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6148-GE-TX)



The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6148V-GE-TX)

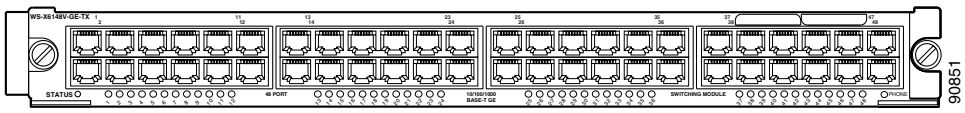
The 48-port 10/100/1000BASE-T switching module (WS-X6148V-GE-TX) provides 48 switched, 10/100/1000-Mbps autosensing, full- or half-duplex ports. (See Figure 2-3.) The module has 48 RJ-45 connectors for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. The "V" in the product number indicates that the inline-power daughter card is installed on the module. With the voice daughter card installed, the module provides these IP phone features on each port:

- Inline power—Provides 48 VDC over standard Category 5, Category 5e, or Category 6 UTP cable up to 328 feet (100 meters) from the switch to the IP phone. With inline power, pairs 2 and 3 (pins 1, 2, 3, and 6) of the four pairs in the cable are used to transmit power (6.3 W) from the switch. This method of supplying power is sometimes called *phantom power* because the power signals travel over the same two pairs used to transmit Ethernet signals. The power signals are completely transparent to the Ethernet signals and do not interfere with their operation.

- Phone discovery—Automatically detects the presence of an IP phone and supplies inline power to the phone.
- Auxiliary VLANs—Provides automatic VLAN configuration for IP phones using IEEE 802.1Q as the standards-based VLAN tagging mechanism between the switch and the IP phone.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-3 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6148V-GE-TX)



The front panel LEDs are described in Table 2-3 on page 2-21.

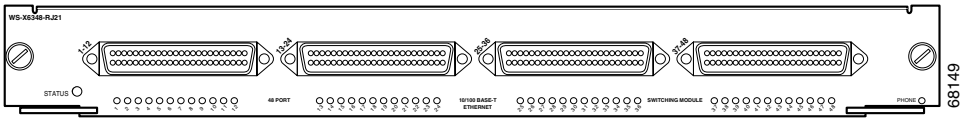
48-Port 10/100BASE-T Ethernet Switching Module (WS-X6148-RJ21V)

The 48-port 10/100BASE-T switching module (WS-X6148-RJ21V) provides 48 switched, 10/100-Mbps autosensing, full- or half-duplex ports. (See Figure 2-4.) The module has 4 RJ-21 connectors (12 ports per connector) for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. The "V" in the product number indicates that the inline-power daughter card (WS-F6K-VPWR) is installed on the module. With the WS-F6K-VPWR daughter card installed, the module provides these IP phone features on each port:

- Inline power—Provides 48 VDC over standard Category 5, Category 5e, or Category 6 UTP cable up to 328 feet (100 meters) from the switch to the IP phone. With inline power, pairs 2 and 3 (pins 1, 2, 3, and 6) of the four pairs in the cable are used to transmit power (6.3 W) from the switch. This method of supplying power is sometimes called *phantom power* because the power signals travel over the same two pairs used to transmit Ethernet signals. The power signals are completely transparent to the Ethernet signals and do not interfere with their operation.
- Phone discovery—Automatically detects the presence of an IP phone and supplies inline power to the phone.
- Auxiliary VLANs—Provides automatic VLAN configuration for IP phones using IEEE 802.1Q as the standards-based VLAN tagging mechanism between the switch and the IP phone.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-4 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6148-RJ21V)



The front panel LEDs are described in Table 2-3 on page 2-21.

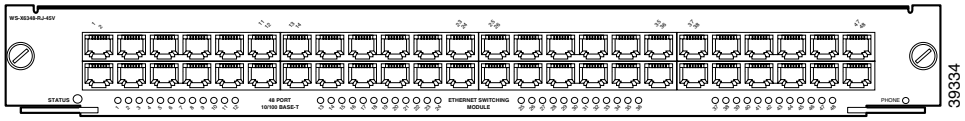
48-Port 10/100BASE-T Ethernet Switching Module (WS-X6148-RJ45V)

The 48-port 10/100BASE-T switching module (WS-X6148-RJ45V) provides 48 switched, 10/100-Mbps autosensing, full- or half-duplex ports. (See Figure 2-5.) The module has 48 RJ-45 connectors for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. The "V" in the product number indicates that the inline-power daughter card (WS-F6K-VPWR) is installed on the module. With the WS-F6K-VPWR daughter card installed, the module provides these IP phone features on each port:

- Inline power—Provides 48 VDC over standard Category 5, Category 5e, or Category 6 UTP cable up to 328 feet (100 meters) from the switch to the IP phone. With inline power, pairs 2 and 3 (pins 1, 2, 3, and 6) of the four pairs in the cable are used to transmit power (6.3 W) from the switch. This method of supplying power is sometimes called *phantom power* because the power signals travel over the same two pairs used to transmit Ethernet signals. The power signals are completely transparent to the Ethernet signals and do not interfere with their operation.
- Phone discovery—Automatically detects the presence of an IP phone and supplies inline power to the phone.
- Auxiliary VLANs—Provides automatic VLAN configuration for IP phones using IEEE 802.1Q as the standards-based VLAN tagging mechanism between the switch and the IP phone.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-5 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6148-RJ45V)



The front panel LEDs are described in Table 2-3 on page 2-21.

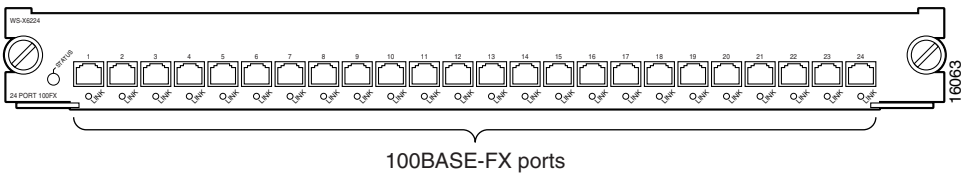
24-Port 100BASE-FX Ethernet Switching Module (WS-X6224-100FX-MT)

The 24-port 100BASE-FX Etherent switching module (WS-X6224-100FX-MT) provides 24 switched, 100-Mbps, full or half-duplex ports. (See Figure 2-6.) Ports have MT-RJ optical connectors for connection to MMF optical cable.

Note This module is a Class 1 laser product. Refer to the *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers* for information on working with lasers.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-6 24-Port 100BASE-FX Ethernet Switching Module (WS-X6224-100FX-MT)



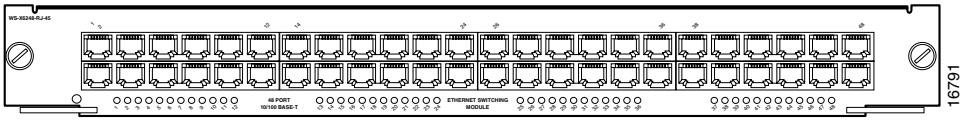
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248-RJ45)

The 48-port 10/100BASE-T Ethernet switching module (WS-X6248-RJ45) provides 48 switched 10/100-Mbps autosensing, full or half-duplex ports. (See Figure 2-7.) The 48 ports have RJ-45 connectors for Category 3, Category 5, Category 5e, or Category 6 UTP or FTP cable.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-7 48-Port 10/100BASE-TX Ethernet Switching Module (WS-X6248-RJ45)



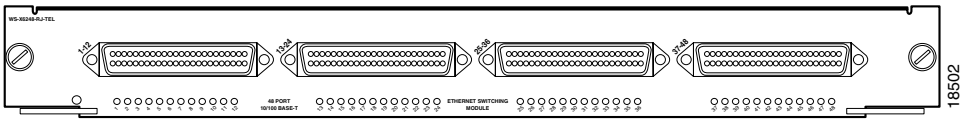
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248-TEL)

The 48-port 10/100BASE-T Ethernet switching module (WS-X6248-TEL) provides 48 switched 10/100-Mbps autosensing, full or half-duplex ports. (See Figure 2-8.) Four RJ-21 connectors (12 ports per connector) use Category 3, Category 5, Category 5e, or Category 6 UTP or FTP cable to connect to the network.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-8 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248-TEL)



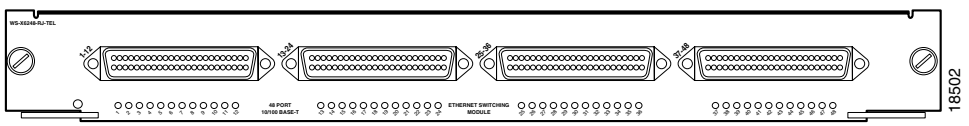
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248A-TEL)

The 48-port 10/100BASE-T Ethernet switching module (WS-X6248A-TEL) provides 48 switched 10/100-Mbps autosensing, full or half-duplex ports. (See Figure 2-9.) The WS-X6248A-TEL Ethernet module has a larger buffer than the WS-X6248-TEL Ethernet module. Four RJ-21 connectors (12 ports per connector) use Category 3, Category 5, Category 5e, or Category 6 UTP or FTP cable to connect to the network.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-9 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6248A-TEL)



The front panel LEDs are described in Table 2-3 on page 2-21.

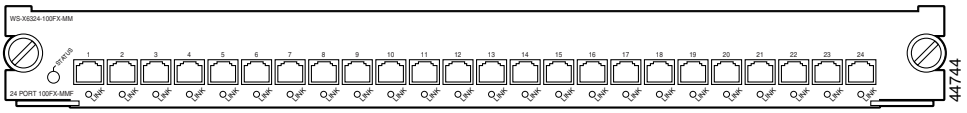
24-Port 100BASE-FX Ethernet Switching Module (WS-X6324-100FX-MM)

The 24-port 100BASE-FX switching module (WS-X6324-100FX-MM) provides 24 switched, 100-Mbps, full- or half-duplex ports. (See Figure 2-10.) The module has 24 MT-RJ connectors for connection to the MMF cable.

Note This module is a Class 1 laser product. Refer to the *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers* for information on working with lasers.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-10 24-Port 100BASE-FX Ethernet Switching Module (WS-X6324-100FX-MM)



The front panel LEDs are described in Table 2-3 on page 2-21.

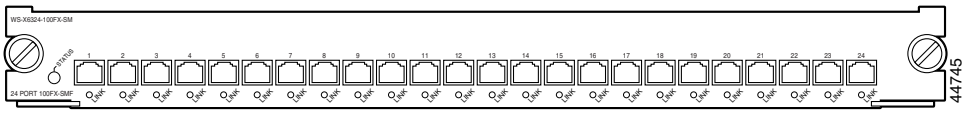
24-Port 100BASE-FX Ethernet Switching Module (WS-X6324-100FX-SM)

The 24-port 100BASE-FX switching module (WS-X6324-100FX-SM) provides 24 switched, 100-Mbps, full- or half-duplex ports. (See Figure 2-11.) The module has 24 MT-RJ connectors for connection to SMF cable.

Note This module is a Class 1 laser product. Refer to the *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers* for information on working with lasers.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-11 24-Port 100BASE-FX Ethernet Switching Module (WS-X6324-100FX-SM)



The front panel LEDs are described in Table 2-3 on page 2-21.

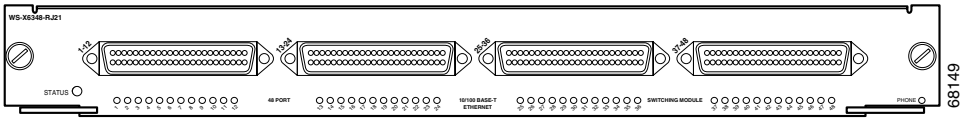
48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ21V)

The 48-port 10/100BASE-T switching module (WS-X6148-RJ21V) provides 48 switched, 10/100-Mbps autosensing, full- or half-duplex ports. (See Figure 2-12.) The module has 4 RJ-21 connectors (12 ports per connector) for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. The "V" in the product number indicates that the inline-power daughter card (WS-F6K-VPWR) is installed on the module. With the WS-F6K-VPWR daughter card installed, the module provides these IP phone features on each port:

- Inline power—Provides 48 VDC over standard Category 5, Category 5e, or Category 6 UTP cable up to 328 feet (100 meters) from the switch to the IP phone. With inline power, pairs 2 and 3 (pins 1, 2, 3, and 6) of the four pairs in the cable are used to transmit power (6.3 W) from the switch. This method of supplying power is sometimes called *phantom power* because the power signals travel over the same two pairs used to transmit Ethernet signals. The power signals are completely transparent to the Ethernet signals and do not interfere with their operation.
- Phone discovery—Automatically detects the presence of an IP phone and supplies inline power to the phone.
- Auxiliary VLANs—Provides automatic VLAN configuration for IP phones using IEEE 802.1Q as the standards-based VLAN tagging mechanism between the switch and the IP phone.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-12 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ-21V)



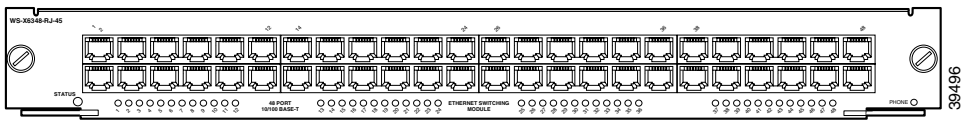
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ-45)

The 48-port 10/100BASE-T switching module (WS-X6348-RJ-45) provides 48 switched, 10/100-Mbps autosensing, full- or half-duplex ports. (See Figure 2-13.) The module has 48 RJ-45 connectors for connection to either Category 3, Category 5, Category 5e, or Category 6 UTP or FTP cable. This module can be upgraded with an inline-power daughter card to support IP phones.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-13 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ-45)



The front panel LEDs are described in Table 2-3 on page 2-21.

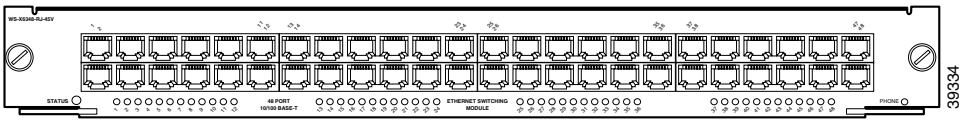
48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ45V)

The 48-port 10/100BASE-T switching module (WS-X6348-RJ45V) provides 48 switched, 10/100-Mbps autosensing, full- or half-duplex ports. (See Figure 2-14.) The module has 48 RJ-45 connectors for use with either Category 3, Category 5, Category 5e, or Category 6 UTP or FTP cable. The "V" in the product number indicates that the inline-power daughter card (WS-F6K-VPWR) is installed on the module. With the WS-F6K-VPWR daughter card installed, the module provides these IP phone features on each port:

- Inline power—Provides 48 VDC over standard Category 5, Category 5e, or Category 6 UTP cable up to 328 feet (100 meters) from the switch to the IP phone. With inline power, pairs 2 and 3 (pins 1, 2, 3, and 6) of the four pairs in the cable are used to transmit power (6.3 W) from the switch. This method of supplying power is sometimes called *phantom power* because the power signals travel over the same two pairs used to transmit Ethernet signals. The power signals are completely transparent to the Ethernet signals and do not interfere with their operation.
- Phone discovery—Automatically detects the presence of an IP phone and supplies inline power to the phone.
- Auxiliary VLANs—Provides automatic VLAN configuration for IP phones using IEEE 802.1Q as the standards-based VLAN tagging mechanism between the switch and the IP phone.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-14 48-Port 10/100BASE-T Ethernet Switching Module (WS-X6348-RJ45V)



The front panel LEDs are described in Table 2-3 on page 2-21.

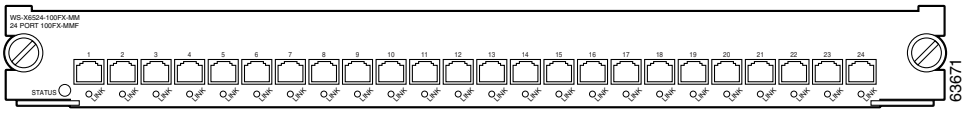
24-Port 100BASE-FX Fabric-Enabled Ethernet Switching Module (WS-X6524-100FX-MM)

The 24-port 100BASE-FX switching module (WS-X6524-100FX-MM) provides 24 switched, 100-Mbps, full- or half-duplex ports. (See Figure 2-15.) Ports have MT-RJ connectors for MMF cable. The WS-X6524-100FX-MM module has 1-MB per-port packet buffers and a single fabric channel interface. The switching module is upgradable to support distributed forwarding with an optional Distributed Forwarding Card (WS-F6K-DFC).

Note This module is a Class 1 laser product. Refer to the *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers* for information on working with lasers.

The QoS port architecture (Rx/Tx) for this module is **1p1q0t/1p3q1t**.

Figure 2-15 24-Port 100BASE-FX Fabric-Enabled Ethernet Switching Module (WS-X6524-100FX-MM)

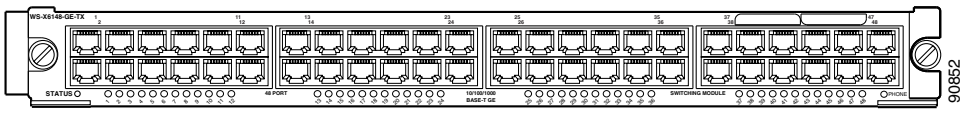


The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6548-GE-TX)

The 48-port 10/100/1000BASE-T switching module (WS-X6548-GE-TX) provides 48 switched, 10/100/1000-Mbps autosensing, full- or half-duplex ports. (See Figure 2-16.) The module has 48 RJ-45 connectors for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. This module can be upgraded with an inline-power daughter card to support IP phones.

Figure 2-16 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS_X6548-GE-TX)



The front panel LEDs are described in Table 2-3 on page 2-21.

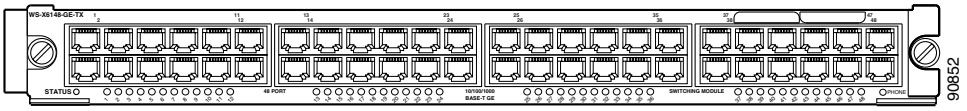
48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6548V-GE-TX)

The 48-port 10/100/1000BASE-T switching module (WS-X6548V-GE-TX) provides 48 switched, 10/100/1000-Mbps autosensing, full- or half-duplex ports. (See Figure 2-17.) The module has 48 RJ-45 connectors for use with either Category 3, Category 5, Category 5e, or Category 6 UTP cable. The "V" in the product number indicates that the inline-power daughter card is installed on the module. With the voice daughter card installed, the module provides these IP phone features on each port:

- Inline power—Provides 48 VDC over standard Category 5, Category 5e, or Category 6 UTP cable up to 328 feet (100 meters) from the switch to the IP phone. With inline power, pairs 2 and 3 (pins 1, 2, 3, and 6) of the four pairs in the cable are used to transmit power (6.3 W) from the switch. This method of supplying power is sometimes called *phantom power* because the power signals travel over the same two pairs used to transmit Ethernet signals. The power signals are completely transparent to the Ethernet signals and do not interfere with their operation.
- Phone discovery—Automatically detects the presence of an IP phone and supplies inline power to the phone.
- Auxiliary VLANs—Provides automatic VLAN configuration for IP phones using IEEE 802.1Q as the standards-based VLAN tagging mechanism between the switch and the IP phone.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-17 48-Port 10/100/1000BASE-T Ethernet Switching Module (WS-X6548V-GE-TX)



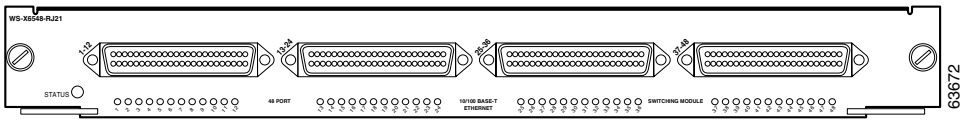
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6548-RJ-21)

The 48-port 10/100BASE-T switching module (WS-X6548-RJ-21) provides 48 switched, 10/100-Mbps, full- or half-duplex ports. (See Figure 2-18.) The module has 4 RJ-21 connectors (12 ports per connector) for Category 5, Category 5e, or Category 6 cable. The WS-X6548-RJ-21 module has 1-MB per-port packet buffers and a single fabric channel interface. The switching module is upgradable to support distributed forwarding with an optional Distributed Forwarding Card (WS-F6K-DFC). The WS-X6548-RJ-21 module is auto-MDI/MDIX capable; you can use either straight or crossover cable, and the module will automatically detect and adjust for the cable type.

The QoS port architecture (Rx/Tx) for this module is **1p1q0t/1p3q1t**.

Figure 2-18 48-Port 10/100BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6548-RJ-21)



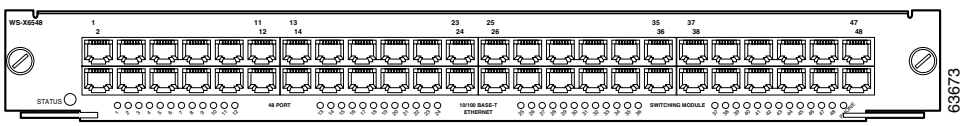
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port 10/100BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6548-RJ-45)

The 48-port 10/100BASE-T switching module (WS-X6548-RJ-45) provides 48 switched, 10/100-Mbps, full- or half-duplex ports. (See Figure 2-19.) Ports have RJ-45 connectors for Category 5, 5e, and 6 cable. The WS-X6548-RJ-45 module has 1-MB per-port packet buffers and a single fabric channel interface. The switching module is upgradable to support distributed forwarding with an optional Distributed Forwarding Card (WS-F6K-DFC). The WS-X6548-RJ-45 module is auto-MDI/MDIX capable; you can use either straight or crossover cable, and the module will automatically detect and adjust for the cable type.

The QoS port architecture (Rx/Tx) for this module is **1p1q0t/1p3q1t**.

Figure 2-19 48-Port 10/100BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6548-RJ-45)



The front panel LEDs are described in Table 2-3 on page 2-21.

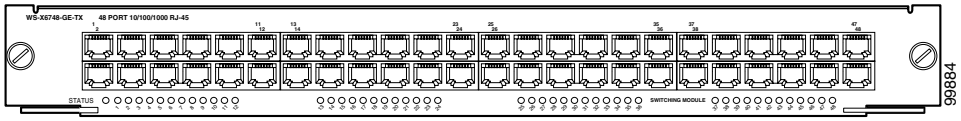
48-Port 10/100/1000BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6748-GE-TX)

The 48-port 10/100/1000BASE-T switching module (WS-X6748-GE-TX) provides 48 switched, 10/100/1000-Mbps, full- or half-duplex ports. (See Figure 2-20.) Ports have RJ-45 connectors for Category 5, Category 5e, and Category 6 cable. The WS-X6748-GE-TX module has 1.3-MB per-port packet buffers and a dual-fabric channel interface. The switching module is upgradable to support distributed forwarding with an optional Distributed Forwarding Card (WS-F6K-DFC3).

The QoS port architecture (Rx/Tx) for this module is **1q8t/1p3q8t**.

Figure 2-20 48-Port 10/100/1000BASE-T Fabric-Enabled Ethernet Switching Module (WS-X6748-GE-TX)

)



The front panel LEDs are described in Table 2-3 on page 2-21.

Gigabit Ethernet Switching Modules

This section describes these Gigabit Ethernet switching modules:

- 16-Port Gigabit Ethernet Switching Module (WS-X6316-GE-TX), page 2-15
- 8-Port Gigabit Ethernet Switching Module (WS-X6408-GBIC), page 2-15
- 8-Port Gigabit Ethernet Switching Module (WS-X6408A-GBIC), page 2-15
- 16-Port Gigabit Ethernet Switching Module (WS-X6416-GBIC), page 2-16
- 16-Port Gigabit Ethernet Switching Module (WS-X6416-GE-MT), page 2-16
- 1-Port 10-Gigabit Ethernet Module (WS-X6501-10GEX4), page 2-17
- 1-Port 10-Gigabit Ethernet Base Module (WS-X6502-10GE), page 2-17
- 16-Port Gigabit Ethernet Switching Module (WS-X6516-GBIC), page 2-17
- 16-Port Gigabit Ethernet Switching Module (WS-X6516A-GBIC), page 2-18
- 16-Port 10/100/1000BASE-T Gigabit Ethernet Switching Module (WS-X6516-GE-TX), page 2-18
- 4-Port 10 Gigabit Ethernet Switching Module (WS-X6704-10GE), page 2-19
- 24-Port Gigabit Ethernet Switching Module (WS-X6724-SFP), page 2-19
- 48-Port Gigabit Ethernet Switching Module (WS-X6748-SFP), page 2-19
- 16-Port Gigabit Ethernet Switching Module (WS-X6816-GBIC), page 2-20
- 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3C), page 2-20
- 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3CXL), page 2-21

For LED indicators, see the "Ethernet Module LEDs" section on page 2-21.

Table 2-2 summarizes some of the features of the Gigabit Ethernet switching modules.

Table 2-2 Gigabit and 10-Gigabit Ethernet Switching Modules Features

Product Number	Backplane Connection	Forwarding	Number of Transmit Queues/Port	Number of Receive Queues/Port
WS-X6316-GE-TX	Bus	Centralized	3	2
WS-X6408-GBIC	Bus	Centralized	3	2
WS-X6408A-GBIC	Bus	Centralized	3	2
WS-X6416-GBIC	Bus	Centralized	3	2
WS-X6416-GE-MT	Bus	Centralized	3	2
WS-X6501-10GEX4	Switch fabric and bus	Centralized. Support for distributed forwarding with optional distributed forwarding card (DFC)	3	2
WS-X6502 -10GE	Switch fabric and bus	Centralized. Support for distributed forwarding with optional DFC	3	2
WS-X6516-GBIC	Switch fabric and bus	Centralized. Support for distributed forwarding with optional DFC	3	2
WS-X6516A-GBIC	Switch fabric and bus	Centralized. Support for distributed forwarding with optional DFC	3	2
WS-X6516-GE-TX	Switch fabric and bus	Centralized. Support for distributed forwarding with optional DFC	3	2
WS-X6704-10GE	Switch fabric[1] (dual channel)	Centralized. Support for distributed forwarding with optional DFC	3	2[2]
WS-X6724-SFP	Switch fabric	Centralized. Support for distributed forwarding with optional DFC	3	2[2]
WS-X6748-SFP	Switch fabric	Centralized. Support for distributed forwarding with optional DFC	3	2[2]
WS-X6816-GBIC	Switch fabric[1] (dual channel)	Distributed forwarding with integrated DFC	3	2
WS-X6708-10G-3C	Switch fabric	Distributed forwarding with integrated DFC	8	8[2]
WS-X6708-10G-3CXL	Switch fabric	Distributed forwarding with integrated DFC	8	8[2]

1. The module can be installed in slots 2–6 in the Cisco 7606, slots 2–9 in the Cisco 7609 and OSR-7609, and slots 9–13 in the Cisco 7613 routers. It cannot be installed in slots 2–8 of the Cisco 7613 router. The module requires a Supervisor Engine 720.
2. Receive queues change depending on whether you have a centralized forward card (CFC) or a DFC. For information about queue structures, see http://www.cisco.com/en/US/docs/routers/7600/ios/12.2SXF/configuration/guide/qos.html#wp1666010.

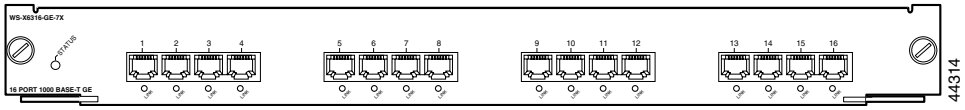
Note These modules are Class 1 laser products. Refer to the *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers* for information on working with lasers.

16-Port Gigabit Ethernet Switching Module (WS-X6316-GE-TX)

The 16-port Gigabit Ethernet switching module (WS-X6316-GE-TX) provides 16 switched, full-duplex Gigabit Ethernet ports. (See Figure 2-21.) Ports have RJ-45 connectors for Category 5 UTP. The WS-X6316-GE-TX module has enhanced QoS features.

The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

Figure 2-21 16-Port Gigabit Ethernet Switching Module (WS-X6316-GE-TX)



The front panel LEDs are described in Table 2-3 on page 2-21.

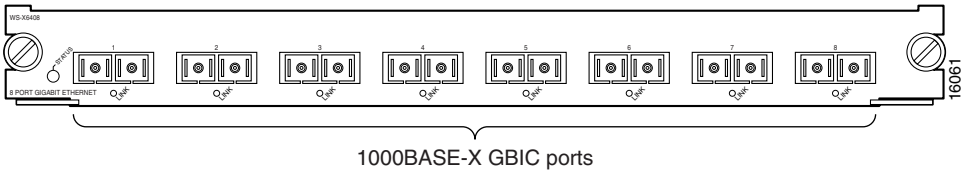
8-Port Gigabit Ethernet Switching Module (WS-X6408-GBIC)

The 8-port Gigabit Ethernet switching module (WS-X6408-GBIC) provides eight switched, full-duplex Gigabit Ethernet ports that you can configure with any combination of 1000BASE-SX, LX/LH, and ZX GBICs, copper GBICs, or Coarse Wave Division Multiplexer (CWDM) GBICs. (See Figure 2-22.)

Note CWDM GBICs are used with the CWDM Passive Optical System. For more information on the CWDM Passive Optical System, refer to the *Installation Note for the CWDM Passive Optical System*.

The QoS port architecture (Rx/Tx) for this module is **1q4t/2q2t**.

Figure 2-22 8-Port Gigabit Ethernet Switching Module (WS-X6408-GBIC)



The front panel LEDs are described in Table 2-3 on page 2-21.

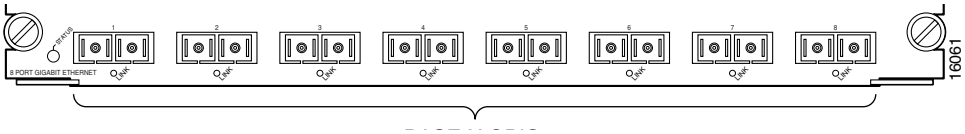
8-Port Gigabit Ethernet Switching Module (WS-X6408A-GBIC)

The 8-port Gigabit Ethernet switching module (WS-X6408A-GBIC) provides eight switched, full-duplex Gigabit Ethernet ports that you can configure with any combination of 1000BASE-SX, LX/LH, and ZX GBICs, copper GBICs, or Coarse Wave Division Multiplexer (CWDM) GBICs. (See Figure 2-23.) The WS-X6408A-GBIC module has enhanced QoS features.

Note CWDM GBICs are used with the CWDM Passive Optical System. For more information on the CWDM Passive Optical System, refer to the *Installation Note for the CWDM Passive Optical System*.

The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

Figure 2-23 8-Port Gigabit Ethernet Switching Module (WS-X6408A-GBIC)



The front panel LEDs are described in Table 2-3 on page 2-21.

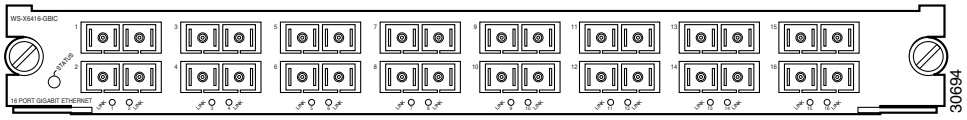
16-Port Gigabit Ethernet Switching Module (WS-X6416-GBIC)

The 16-port Gigabit Ethernet switching module (WS-X6416-GBIC) provides 16 switched, full-duplex Gigabit Ethernet ports that you can configure with any combination of 1000BASE-SX, LX/LH, and ZX GBICs, copper GBICs, or CWDM GBICs. (See Figure 2-24.) The WS-X6416-GBIC module has enhanced QoS features.

Note CWDM GBICs are used with the CWDM Passive Optical System. For more information on the CWDM Passive Optical System, refer to the *Installation Note for the CWDM Passive Optical System*.

The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

Figure 2-24 16-Port Gigabit Ethernet Switching Module (WS-X6416-GBIC)



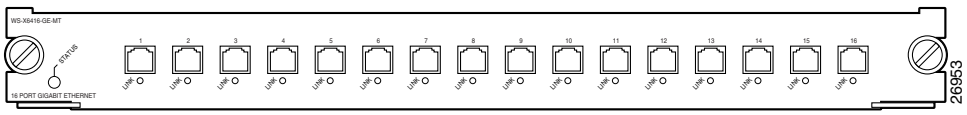
The front panel LEDs are described in Table 2-3 on page 2-21.

16-Port Gigabit Ethernet Switching Module (WS-X6416-GE-MT)

The 16-port Gigabit Ethernet switching module (WS-X6416-GE-MT) provides 16 switched, 1000-Mbps, full-duplex ports. (See Figure 2-25.) The module has 16 MT-RJ connectors for connecting to MMF cable. The WS-X6416-GE-MT module has enhanced QoS features.

The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

Figure 2-25 16-Port Gigabit Ethernet Switching Module (WS-X6416-GE-MT)

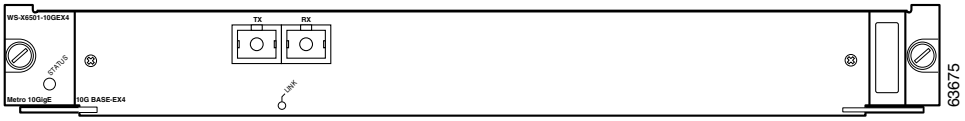


The front panel LEDs are described in Table 2-3 on page 2-21.

1-Port 10-Gigabit Ethernet Module (WS-X6501-10GEX4)

The 1-port 10-Gigabit Ethernet switching module (WS-X6501-10GEX4) provides one 10-Gigabit Ethernet port accessible through an SC connector on the front panel. (See Figure 2-26.) The WS-X6501-10GEX4 module has a single fabric channel interface. The switching module is upgradable to support distributed forwarding with the installation of an optional Distributed Forwarding Card (WS-F6K-DFC).

Figure 2-26 1-Port 10-Gigabit Ethernet Module (WS-X6501-10GEX4)



The front panel LEDs are described in Table 2-3 on page 2-21.

1-Port 10-Gigabit Ethernet Base Module (WS-X6502-10GE)

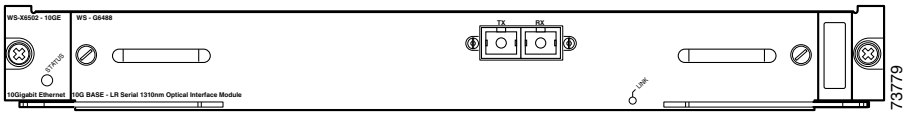
The 1-port 10-Gigabit Ethernet switching module (WS-X6502-10GE) consists of a 10-Gigabit Ethernet Base Module (WS-X6502-10GE) and an Optical Interface Module (OIM). (See Figure 2-27.) The following OIMs are currently available:

- WS-G6483 10GBASE-ER Serial 1550-nm Extended Reach OIM
- WS-G6488 10GBASE-LR Serial 1310-nm Long Haul OIM

The WS-G6483 OIM provides one serial 1550-nm 10-Gigabit Ethernet port through an SC connector. The WS-G6488 OIM provides one serial 1310-nm 10-Gigabit Ethernet port through an SC connector. The switching module is upgradable to support distributed forwarding with an optional Distributed Forwarding Card (WS-F6K-DFC).

The QoS port architecture (Rx/Tx) for this module is **1p1q8t/1p2q1t**.

Figure 2-27 1-Port 10-Gigabit Ethernet Base Module (WS-X6502-10GE) with the WS-G6488 OIM Installed



The front panel LEDs are described in Table 2-3 on page 2-21.

16-Port Gigabit Ethernet Switching Module (WS-X6516-GBIC)

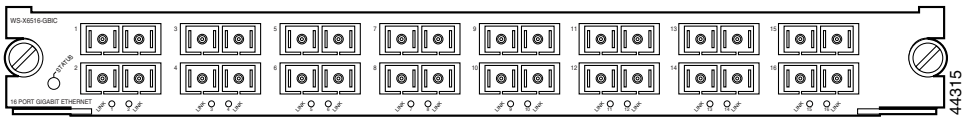
The 16-port Gigabit Ethernet switching module (WS-X6516-GBIC) provides 16 switched, full-duplex Gigabit Ethernet ports that you can configure with any combination of 1000BASE-SX, LX/LH, and ZX GBICs, copper GBICs, or CWDM GBICs. (See Figure 2-28.)

Note CWDM GBICs are used with the CWDM Passive Optical System. For more information on the CWDM Passive Optical System, refer to the *Installation Note for the CWDM Passive Optical System*.

The WS-X6516-GBIC module has enhanced QoS features. The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

The WS-X6516-GBIC module has a single fabric channel interface. The switching module is upgradable to support distributed forwarding by installing an optional Distributed Forwarding Card (WS-F6K-DFC).

Figure 2-28 16-Port Gigabit Ethernet Switching Module (WS-X6516-GBIC)



The front panel LEDs are described in Table 2-3 on page 2-21.

16-Port Gigabit Ethernet Switching Module (WS-X6516A-GBIC)

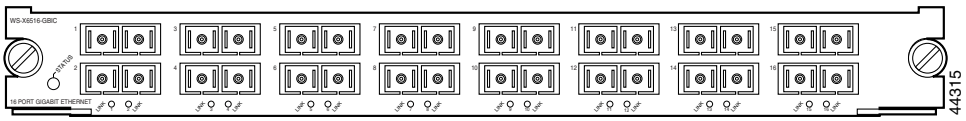
The 16-port Gigabit Ethernet switching module (WS-X6516A-GBIC) provides 16 switched, full-duplex Gigabit Ethernet ports that you can configure with any combination of 1000BASE-SX, LX/LH, and ZX GBICs, copper GBICs, or CWDM GBICs. (See Figure 2-28.)

Note CWDM GBICs are used with the CWDM Passive Optical System. For more information on the CWDM Passive Optical System, refer to the *Installation Note for the CWDM Passive Optical System*.

The WS-X6516A-GBIC module has enhanced QoS features. The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**. The module has 1 MB per port buffers.

The WS-X6516A-GBIC module has a single fabric channel interface. The switching module is upgradable to support distributed forwarding by installing an optional Distributed Forwarding Card (WS-F6K-DFC).

Figure 2-29 16-Port Gigabit Ethernet Switching Module (WS-X6516A-GBIC)



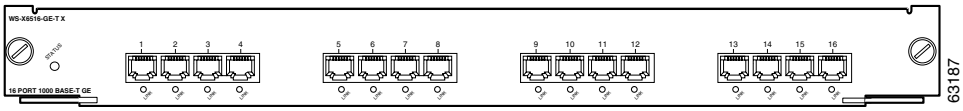
The front panel LEDs are described in Table 2-3 on page 2-21.

16-Port 10/100/1000BASE-T Gigabit Ethernet Switching Module (WS-X6516-GE-TX)

The 16-port Gigabit Ethernet switching module (WS-X6516-GE-TX) provides 16 switched, 10/100/1000BASE-T Gigabit Ethernet ports. (See Figure 2-30.) The ports have RJ-45 connectors for Category 5 UTP. The WS-X6516-GE-TX module has a single fabric channel interface. The switching module is upgradable to support distributed forwarding by installing an optional Distributed Forwarding Card (WS-F6K-DFC).

The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

Figure 2-30 16-Port 10/100/1000BASE-T Gigabit Ethernet Switching Module (WS-X6516-GE-TX)



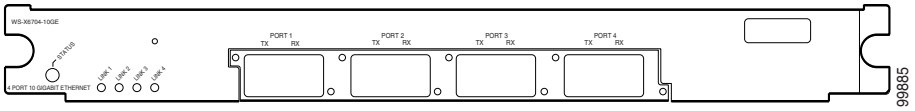
The front panel LEDs are described in Table 2-3 on page 2-21.

4-Port 10 Gigabit Ethernet Switching Module (WS-X6704-10GE)

The 4-port 10-Gigabit Ethernet switching module (WS-X6704-10GE) provides 4 switched, 10-Gigabit Ethernet ports. (See Figure 2-31.) The four ports support hot-swappable 10GBASE-LR long-reach or 10GBASE-ER extended reach XenPak optical transceivers. The WS-X6704-10GE module has dual fabric channel interface and requires the Supervisor Engine 720.

The QoS port architecture (Rx/Tx) for this module is **1q8t/1p7q8t**.

Figure 2-31 4-Port 10 Gigabit Ethernet Switching Module (WS-X6704-10GE)



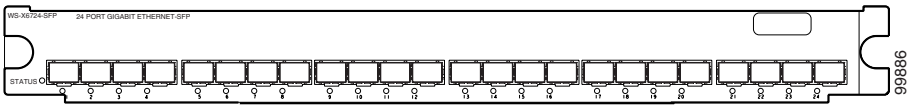
The front panel LEDs are described in Table 2-3 on page 2-21.

24-Port Gigabit Ethernet Switching Module (WS-X6724-SFP)

The 24-port Gigabit Ethernet switching module (WS-X6724-SFP) provides 24 switched, Gigabit Ethernet ports. (See Figure 2-32.) The 24 ports support hot-swappable Small Form-Factor Pluggable (SFP) 1000BASE-SX, 1000BASE-LX/LH, and 1000BASE-ZX optical transceivers. The WS-X6724-SFP module has single fabric channel interface and requires the Supervisor Engine 720.

The QoS port architecture (Rx/Tx) for this module is **1q8t/1p3q8t**.

Figure 2-32 24-Port Gigabit Ethernet Switching Module (WS-X6724-SFP)



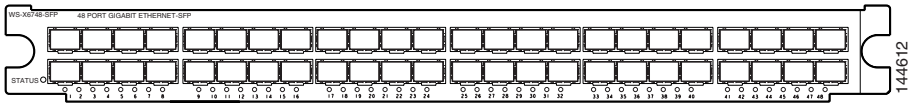
The front panel LEDs are described in Table 2-3 on page 2-21.

48-Port Gigabit Ethernet Switching Module (WS-X6748-SFP)

The 48-port Gigabit Ethernet switching module (WS-X6748-SFP) provides 48 switched, Gigabit Ethernet ports. (See Figure 2-33.) The 48 ports support hot-swappable Small Form-Factor Pluggable (SFP) 1000BASE-SX, 1000BASE-LX/LH, and 1000BASE-ZX optical transceivers. The WS-X6748-SFP module has a dual fabric channel interface and requires the Supervisor Engine 720.

The QoS port architecture (Rx/Tx) for this module is **1q8t/1p3q8t**.

Figure 2-33 48-Port Gigabit Ethernet Switching Module (WS-X6748-SFP)



The front panel LEDs are described in Table 2-3 on page 2-21.

16-Port Gigabit Ethernet Switching Module (WS-X6816-GBIC)

The 16-Port Gigabit Ethernet switching module (WS-X6816-GBIC) provides 16 switched, full-duplex Gigabit Ethernet ports that you can configure with any combination of 1000BASE-SX, LX/LH, and ZX GBICs, copper GBICs, or CWDM GBICs. (See Figure 2-34.)

Note CWDM GBICs are used with the CWDM Passive Optical System. For more information on the CWDM Passive Optical System, refer to the *Installation Note for the CWDM Passive Optical System*.

The WS-X6816-GBIC is a fabric-dependent module that has enhanced QoS features. The QoS port architecture (Rx/Tx) for this module is **1p1q4t/1p2q2t**.

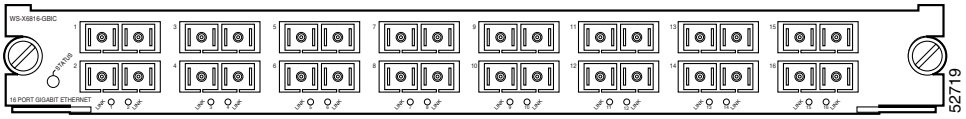
The WS-X6816-GBIC module has the following installation restrictions:

- The WS-X6816-GBIC requires a Supervisor Engine 2 or Supervisor Engine 720.

  Note The WS-X6816-GBIC must have a DFC3A daughter card installed to operate with the Supervisor Engine 720.

- A Switch Fabric Module must be installed in the Cisco 7600 series routers chassis when a WS-X6816-GBIC module is installed.
- The WS-X6816-GBIC can be installed in slots 2 through 6 in the Cisco 7606 router.
- The WS-X6816-GBIC can be installed in slots 2 through 9 in the Cisco 7609 router.
- The WS-X6816-GBIC can only be installed in slots 9 through 13 in the Cisco 7613 router; it cannot be installed in slots 2 through 8.

Figure 2-34 16-Port Gigabit Ethernet Switching Module (WS-X6816-GBIC)



The front panel LEDs are described in Table 2-3 on page 2-21.

8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3C)

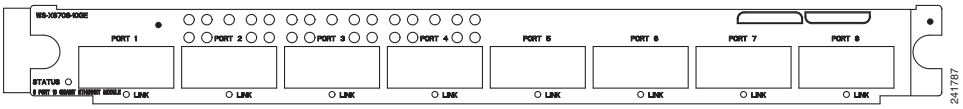
The 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3C) comprises a WS-X6708-10GE base board and a distributed forwarding card. The base module supports up to eight pluggable X2 optics and has a 40 Gbps connection to the fabric and is therefore 2:1 oversubscribed. The distributed

forwarding card provides hardware-based MAC learning and forwards traffic at 48 Mpps. The 8-port 10 Gigabit Ethernet module can demonstrate 60 Gbps local switching. Besides increased port density, it also has increased port buffering and enhanced queuing and scheduling mechanisms for congestion management.

The 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3C) supports the following optics: X2-10GB-SR, X2-10GB-LR, X2-10GB-ER, X2-10GB-LX4, and X2-10GB-CX4.

The QoS port architecture (Rx/Tx) for this module is **8q4t/1p7q4t**.

Figure 2-35 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3C)



The front panel LEDs are described in Table 2-3 on page 2-21.

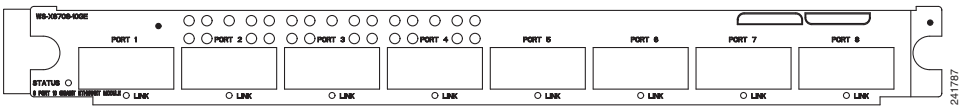
8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3CXL)

The 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3CXL) comprises a WS-X6708-10GE base board and a distributed forwarding card (WS-F6700-DFC3CXL). The base module supports up to eight pluggable X2 optics and has a 40 Gbps connection to the fabric and is therefore 2:1 oversubscribed. The distributed forwarding card provides hardware-based MAC learning and forwards traffic at 48 Mpps. The 8-port 10 Gigabit Ethernet module can demonstrate 60 Gbps local switching. Besides increased port density, it also has increased port buffering and enhanced queuing and scheduling mechanisms for congestion management. .

The 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3CXL) supports the following optics: X2-10GB-SR, X2-10GB-LR, X2-10GB-ER, X2-10GB-LX4, and X2-10GB-CX4.

The QoS port architecture (Rx/Tx) for this module is **8q4t/1p7q4t**.

Figure 2-36 8-Port Gigabit Ethernet Switching Module (WS-X6708-10G-3C)



The front panel LEDs are described in Table 2-3 on page 2-21.

Ethernet Module LEDs

The Ethernet and Gigabit Ethernet module front-panel LEDs are described in Table 2-3.

Table 2-3 Ethernet and Gigabit Ethernet Module LEDs

LED	Color/State	Description
STATUS	Green	All diagnostics pass; the module is operational.

Table 2-3 Ethernet and Gigabit Ethernet Module LEDs (continued)

LED	Color/State	Description
	Orange	The module is booting or running diagnostics.
		An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.)
	Red	The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence.
		An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.)
		If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online.
	Off	The module is not receiving power.

Table 2-3 Ethernet and Gigabit Ethernet Module LEDs (continued)

LED	Color/State	Description
LINK	Green	The port is active (the link is connected and operational).
	Orange	The module or port is disabled through the CLI command or the module is initializing[1].
	Flashing orange	The port is faulty and has been disabled.
	Off	The port is not active or the link is not connected.
PHONE	Green	The voice daughter card is installed.
	Off	The voice daughter card is not detected or is not installed.

1. This is a good time to verify that all LINK LEDs are functioning.